

WHAT IS CLAIMED IS:

1. An article comprising an ultrasonically bonded laminated structure, the laminated structure comprising a first material, a second material, and an adhesive composition, the adhesive composition comprising an atactic polymer and an isotactic polymer, the atactic polymer having a degree of crystallinity of less than about 20% and a number-average molecular weight of from about 1,000 to about 300,000 and the isotactic polymer having a degree of crystallinity of at least about 40% and a number-average molecular weight of from about 3,000 to about 200,000, wherein the first material and the second material are dissimilar or non-bondable materials and are ultrasonically bonded together.

2. The article as set forth in claim 1 wherein the degree of crystallinity of the atactic polymer is less than about 15%.

3. The article as set forth in claim 1 wherein the degree of crystallinity of the isotactic polymer is at least about 60%.

4. The article as set forth in claim 1 wherein the number-average molecular weight of the atactic polymer is between about 3,000 and about 100,000.

5. The article as set forth in claim 1 wherein the number-average molecular weight of the isotactic polymer is between about 10,000 and about 100,000.

6. The article as set forth in claim 1 wherein the adhesive composition is hot-melt processable at less than about 400 degrees Fahrenheit.

7. The article as set forth in claim 1 wherein the

adhesive composition is hot-melt processable at less than about 375 degrees Fahrenheit.

8. The article as set forth in claim 1 wherein the adhesive composition has a melt index of from about 100 to about 2000 grams per 10 minutes.

9. The article as set forth in claim 1 wherein the adhesive composition comprises from about 40 to about 90 weight percent of the atactic polymer and from about 5 to about 30 weight percent of the isotactic polymer.

10. The article as set forth in claim 1 wherein the atactic polymer comprises atactic polypropylene.

11. The article as set forth in claim 1 wherein the atactic polymer is selected from the group consisting of low density polyethylene, atactic polystyrene, atactic polybutene, amorphous polyolefin copolymer, and combinations thereof.

12. The article as set forth in claim 11 wherein the low density polyethylene has a density in the range of 0.910 to 0.935 grams per cubic centimeter.

13. The article as set forth in claim 1 wherein the isotactic polymer comprises isotactic polypropylene.

14. The article as set forth in claim 1 wherein the isotactic polymer is selected from the group consisting of high density polyethylene, isotactic polystyrene, isotactic polybutene, and combinations thereof.

15. The article as set forth in claim 14 wherein the high density polyethylene has a density in the range of 0.935 to 0.980 grams per cubic centimeter.

16. The article as set forth in claim 1 wherein the first material comprises polyethylene and the second material comprises polypropylene.

17. The article as set forth in claim 1 wherein the first material comprises polypropylene and the second material comprises a cellulosic material.

18. The article as set forth in claim 1 wherein the first material comprises polyethylene and the second material comprises a cellulosic material.

19. The article as set forth in claim 1 wherein the first material comprises a cellulosic material and the second material comprises a cellulosic material.

20. The article as set forth in claim 1 wherein the first material comprises polylactic acid and the second material comprises a cellulosic material.

21. The article as set forth in claim 1 wherein the first material comprises nylon and the second material comprises a cellulosic material.

22. The article as set forth in claim 1 wherein the first material comprises polystyrene and the second material comprises a cellulosic material.

23. The article as set forth in claim 1 wherein the first material comprises polyester and the second material comprises a cellulosic material.

24. The article as set forth in claim 1 wherein the first material comprises rubber and the second material comprises a cellulosic material.

25. The article as set forth in claim 1 wherein the

first material comprises polyurethane and the second material comprises a cellulosic material.

26. The article as set forth in claim 1 wherein the adhesive composition additionally comprises a further component selected from the group consisting of tackifiers, antioxidants, color pigments, viscosity modifiers, fillers,
5 and polymeric compatibilizers.

27. A process for manufacturing an article comprising an ultrasonically bonded laminated structure, the process comprising:

providing a first substrate comprising an adhesive
5 composition, the adhesive composition comprising an atactic polymer and an isotactic polymer, the atactic polymer having a degree of crystallinity of less than about 20% and a number-average molecular weight of from about 1,000 to about 300,000 and the isotactic polymer having a degree of
10 crystallinity of at least about 40% and a number-average molecular weight of from about 3,000 to about 200,000;

providing a second substrate dissimilar or non-bondable with the first substrate; and

ultrasonically bonding the first substrate to the second
15 substrate.

28. The process as set forth in claim 27 wherein the degree of crystallinity of the atactic polymer is less than about 15%.

29. The process as set forth in claim 27 wherein the degree of crystallinity of the isotactic polymer is at least about 60%.

30. The process as set forth in claim 27 wherein the number-average molecular weight of the atactic polymer is between about 3,000 and about 100,000.

31. The process as set forth in claim 27 wherein the number-average molecular weight of the isotactic polymer is between about 10,000 and about 100,000.

32. The process as set forth in claim 27 wherein the adhesive composition is hot-melt processable at less than about 400 degrees Fahrenheit.

33. The process as set forth in claim 27 wherein the adhesive composition is hot-melt processable at less than about 375 degrees Fahrenheit.

34. The process as set forth in claim 27 wherein the adhesive composition has a melt index of from about 100 to about 2000 grams per 10 minutes.

35. The process as set forth in claim 27 wherein the adhesive composition comprises from about 40 to about 90 weight percent of the atactic polymer and from about 5 to about 30 weight percent of the isotactic polymer.

36. The process as set forth in claim 27 wherein the atactic polymer comprises atactic polypropylene.

37. The process as set forth in claim 27 wherein the atactic polymer is selected from the group consisting of low density polyethylene, atactic polystyrene, atactic polybutene, amorphous polyolefin copolymer, and combinations thereof.

38. The process as set forth in claim 37 wherein the low density polyethylene has a density in the range of 0.910 to 0.935 grams per cubic centimeter.

39. The process as set forth in claim 27 wherein the isotactic polymer comprises isotactic polypropylene.

40. The process as set forth in claim 27 wherein the isotactic polymer is selected from the group consisting of high density polyethylene, isotactic polystyrene, isotactic polybutene, and combinations thereof.

41. The process as set forth in claim 40 wherein the high density polyethylene has a density in the range of 0.935 to 0.980 grams per cubic centimeter.

42. The process as set forth in claim 27 wherein the first material comprises polyethylene and the second material comprises polypropylene.

43. The process as set forth in claim 27 wherein the first material comprises polypropylene and the second material comprises a cellulosic material.

44. The process as set forth in claim 27 wherein the first material comprises polyethylene and the second material comprises a cellulosic material.

45. The process as set forth in claim 27 wherein the first material comprises a cellulosic material and the second material comprises a cellulosic material.

46. The process as set forth in claim 27 wherein the first material comprises polylactic acid and the second material comprises a cellulosic material.

47. The process as set forth in claim 27 wherein the first material comprises nylon and the second material comprises a cellulosic material.

48. The process as set forth in claim 27 wherein the first material comprises polystyrene and the second material comprises a cellulosic material.

49. The process as set forth in claim 27 wherein the first material comprises polyester and the second material comprises a cellulosic material.

50. The process as set forth in claim 27 wherein the first material comprises rubber and the second material comprises a cellulosic material.

51. The process as set forth in claim 27 wherein the first material comprises polyurethane and the second material comprises a cellulosic material.

52. The process as set forth in claim 27 wherein the adhesive composition additionally comprises a further component selected from the group consisting of tackifiers, antioxidants, viscosity modifiers, color pigments, fillers,
5 and polymeric compatibilizers.

53. A process for manufacturing an article comprising an ultrasonically bonded laminated structure, the process comprising:

providing a first substrate;

5 providing a second substrate which is dissimilar or non-bondable with the first substrate;

introducing an adhesive composition onto the first or second substrate and contacting the first and second substrate together to form an adhesive bond therebetween, the
10 adhesive composition comprising an atactic polymer and an isotactic polymer, the atactic polymer having a degree of crystallinity of less than about 20% and a number-average molecular weight of from about 1,000 to about 300,000 and the isotactic polymer having a degree of crystallinity of at
15 least about 40% and a number-average molecular weight of from about 3,000 to about 200,000; and

ultrasonically bonding the first substrate to the second

substrate.

54. The process as set forth in claim 53 wherein the degree of crystallinity of the atactic polymer is less than about 15%.

55. The process as set forth in claim 53 wherein the degree of crystallinity of the isotactic polymer is at least about 60%.

56. The process as set forth in claim 53 wherein the number-average molecular weight of the atactic polymer is between about 3,000 and about 100,000.

57. The process as set forth in claim 53 wherein the number-average molecular weight of the isotactic polymer is between about 10,000 and about 100,000.

58. The process as set forth in claim 53 wherein the adhesive composition is hot-melt processable at less than about 400 degrees Fahrenheit.

59. The process as set forth in claim 53 wherein the adhesive composition is hot-melt processable at less than about 375 degrees Fahrenheit.

60. The process as set forth in claim 53 wherein the adhesive composition has a melt index of from about 100 to about 2000 grams per 10 minutes.

61. The process as set forth in claim 53 wherein the adhesive composition comprises from about 40 to about 90 weight percent of the atactic polymer and from about 5 to about 30 weight percent of the isotactic polymer.

62. The process as set forth in claim 53 wherein the atactic polymer comprises atactic polypropylene.

63. The process as set forth in claim 53 wherein the atactic polymer is selected from the group consisting of low density polyethylene, atactic polystyrene, atactic polybutene, amorphous polyolefin copolymer, and combinations thereof.

64. The process as set forth in claim 63 wherein the low density polyethylene has a density in the range of 0.910 to 0.935 grams per cubic centimeter.

65. The process as set forth in claim 53 wherein the isotactic polymer comprises isotactic polypropylene.

66. The process as set forth in claim 53 wherein the isotactic polymer is selected from the group consisting of high density polyethylene, isotactic polystyrene, isotactic polybutene, and combinations thereof.

67. The process as set forth in claim 66 wherein the high density polyethylene has a density in the range of 0.935 to 0.980 grams per cubic centimeter.

68. The process as set forth in claim 53 wherein the first material comprises polyethylene and the second material comprises polypropylene.

69. The process as set forth in claim 53 wherein the first material comprises polypropylene and the second material comprises cellulosic material.

70. The process as set forth in claim 53 wherein the first material comprises polyethylene and the second material comprises a cellulosic material.

71. The process as set forth in claim 53 wherein the first material comprises a cellulosic material and the second material comprises a cellulosic material.

72. The process as set forth in claim 53 wherein the first material comprises polylactic acid and the second material comprises a cellulosic material.

73. The process as set forth in claim 53 wherein the first material comprises nylon and the second material comprises a cellulosic material.

74. The process as set forth in claim 53 wherein the first material comprises polystyrene and the second material comprises a cellulosic material.

75. The process as set forth in claim 53 wherein the first material comprises polyester and the second material comprises a cellulosic material.

76. The process as set forth in claim 53 wherein the first material comprises rubber and the second material comprises a cellulosic material.

77. The process as set forth in claim 53 wherein the first material comprises polyurethane and the second material comprises a cellulosic material.

78. The process as set forth in claim 53 wherein the adhesive composition additionally comprises a further component selected from the group consisting of tackifiers, antioxidants, viscosity modifiers, color pigments, fillers,
5 and polymeric compatibilizers.

79. An article comprising an ultrasonically bonded laminated structure, the laminated structure comprising a first material, a second material, and an adhesive composition, the adhesive composition comprising an atactic
5 polymer and an isotactic polymer, the atactic polymer having a degree of crystallinity of less than about 20% and a

number-average molecular weight of from about 1,000 to about 300,000 and the isotactic polymer having a degree of crystallinity of at least about 40% and a number-average
10 molecular weight of from about 3,000 to about 200,000, wherein the first material and the second material are dissimilar or non-bondable materials and are ultrasonically bonded together, and wherein the adhesive composition has an open time of less than about 10 minutes.

80. The article as set forth in claim 79 wherein the degree of crystallinity of the atactic polymer is less than about 15%.

81. The article as set forth in claim 79 wherein the degree of crystallinity of the isotactic polymer is at least about 60%.

82. The article as set forth in claim 79 wherein the number-average molecular weight of the atactic polymer is between about 3,000 and about 100,000.

83. The article as set forth in claim 79 wherein the number-average molecular weight of the isotactic polymer is between about 10,000 and about 100,000.

84. The article as set forth in claim 79 wherein the adhesive composition is hot-melt processable at less than about 400 degrees Fahrenheit.

85. The article as set forth in claim 79 wherein the adhesive composition is hot-melt processable at less than about 375 degrees Fahrenheit.

86. The article as set forth in claim 79 wherein the adhesive composition has a melt index of from about 100 to about 2000 grams per 10 minutes.

87. The article as set forth in claim 79 wherein the adhesive composition comprises from about 40 to about 90 weight percent of the atactic polymer and from about 5 to about 30 weight percent of the isotactic polymer.

88. The article as set forth in claim 79 wherein the atactic polymer comprises atactic polypropylene.

89. The article as set forth in claim 79 wherein the atactic polymer is selected from the group consisting of low density polyethylene, atactic polystyrene, atactic polybutene, amorphous polyolefin copolymer, and combinations
5 thereof.

90. The article as set forth in claim 89 wherein the low density polyethylene has a density in the range of 0.910 to 0.935 grams per cubic centimeter.

91. The article as set forth in claim 79 wherein the isotactic polymer comprises isotactic polypropylene.

92. The article as set forth in claim 79 wherein the isotactic polymer is selected from the group consisting of high density polyethylene, isotactic polystyrene, isotactic polybutene, and combinations thereof.

93. The article as set forth in claim 92 wherein the high density polyethylene has a density in the range of 0.935 to 0.980 grams per cubic centimeter.

94. The article as set forth in claim 79 wherein the first material comprises polyethylene and the second material comprises polypropylene.

95. The article as set forth in claim 79 wherein the first material comprises polypropylene and the second material comprises a cellulosic material.

96. The article as set forth in claim 79 wherein the first material comprises polyethylene and the second material comprises a cellulosic material.

97. The article as set forth in claim 79 wherein the first material comprises a cellulosic material and the second material comprises a cellulosic material.

98. The article as set forth in claim 79 wherein the first material comprises polylactic acid and the second material comprises a cellulosic material.

99. The article as set forth in claim 79 wherein the first material comprises nylon and the second material comprises a cellulosic material.

100. The article as set forth in claim 79 wherein the first material comprises polystyrene and the second material comprises a cellulosic material.

101. The article as set forth in claim 79 wherein the first material comprises polyester and the second material comprises a cellulosic material.

102. The article as set forth in claim 79 wherein the first material comprises rubber and the second material comprises a cellulosic material.

103. The article as set forth in claim 79 wherein the first material comprises polyurethane and the second material comprises a cellulosic material.

104. The article as set forth in claim 79 wherein the adhesive composition additionally comprises a further component selected from the group consisting of tackifiers, antioxidants, viscosity modifiers, color pigments, fillers,
5 and polymeric compatibilizers.